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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample and a personnel evaluation form are also included. (AG)

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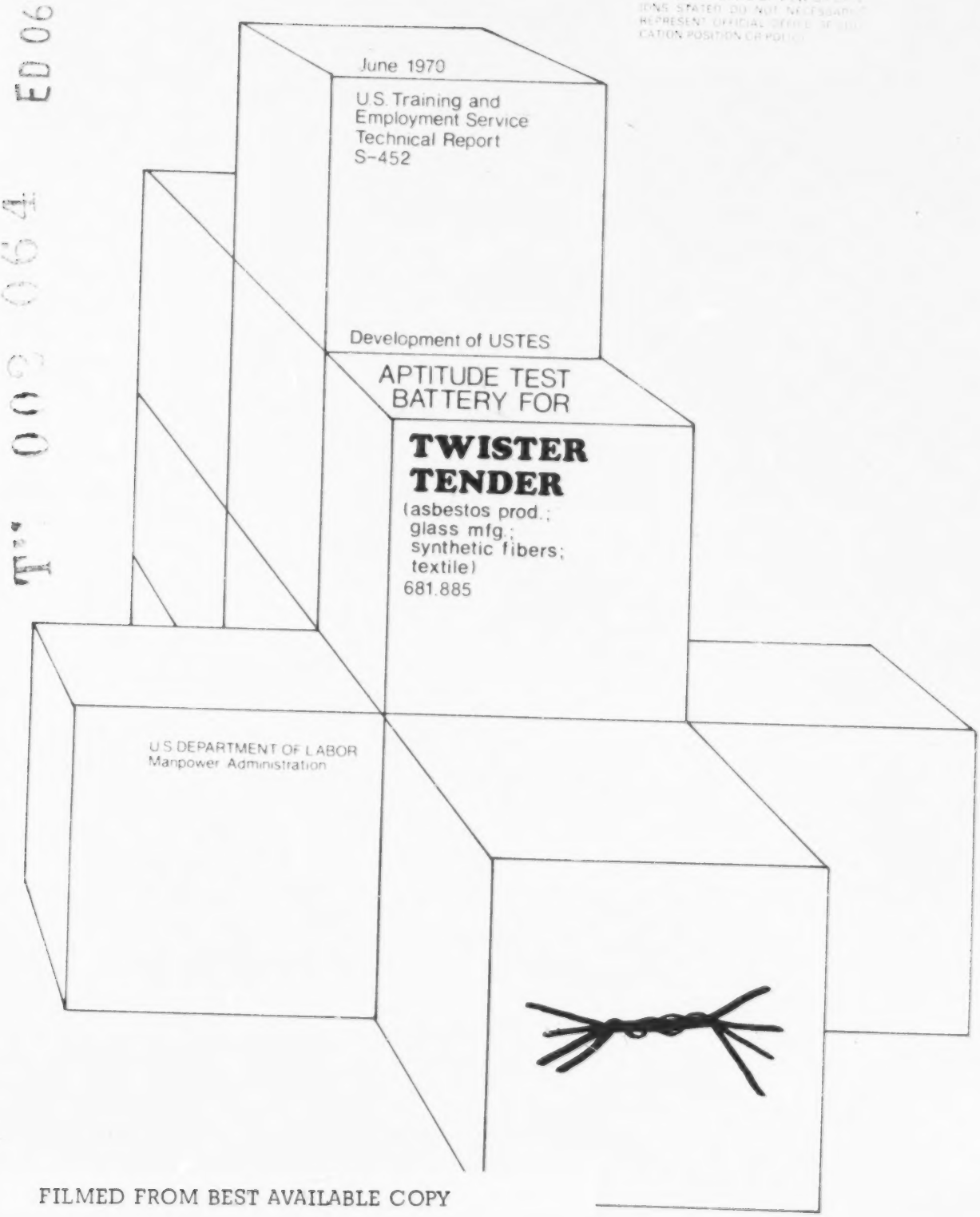

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ED 069639

Technical Report on Development of USTES Aptitude Test Battery
For . . . .

Twister-Tender (asbestos prod.; glass mfg.;
synthetic fibers; textile) 681.885

(Developed in Cooperation with the
Florida State Employment Service)

S-452

U. S. Department of Labor
Manpower Administration

June 1970

FOREWORD

The United States Training and Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

Study #2781

DEVELOPMENT OF USES APTITUDE TEST BATTERY

for

Twister-Tender (asbestos prod.; glass mfg.; synthetic fibers; textile)
681.885-110

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Twister-Tender (asbestos prod.; glass mfg.; synthetic fibers; textile) 681.885-110.

GATB Aptitudes	Minimum Acceptable GATB Scores
P - Form Perception	105
Q - Clerical Perception	95
K - Motor Coordination	85

RESEARCH SUMMARY

Sample:

61 female Twister-Tenders employed at Monsanto Corporation, Pensacola, Florida. Eighteen of the sample members were Negro. The rest of the sample consisted of nonminority group members.

Criterion:

Supervisory ratings.

Design:

Longitudinal (tests were administered at the beginning of training and criterion data were collected at the end of training). Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude-criterion correlations, and selective efficiencies.

Predictive Validity:

Phi Coefficient = .28 ($P/2 < .025$)

Effectiveness of Norms:

Only 67% of the nontest-selected workers used for this study were good workers. If the workers had been test-selected with the above norms, 79% would have been good workers. 33% of the nontest-selected workers used for this study were poor workers. If the workers had been test-selected with the above norms, only 21% would have been poor workers. The effectiveness of the norms is shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	67%	79%
Poor Workers	33%	21%

SAMPLE DESCRIPTION

Size:

N = 61

Occupational Status:

Employed Workers

Work Setting:

Workers were employed at Monsanto Corporation, Pensacola, Florida

Employer Selection Requirements:

Education: Ninth Grade

Previous Experience: None

Tests: None used

Principal Activities:

The job duties for each worker are comparable to those shown in the job description in the appendix.

Minimum Experience:

All workers in the sample had at least one year experience on the job.

TABLE 2

Means (M), Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age and Education.

	Mean	SD	Range	r
Age (years)	24.3	5.3	18-40	-.311*
Education (years)	11.8	1.0	9-14	-.056

*Significant at the .05 level.

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002A were administered during the period of June to September 1968.

CRITERION

The criterion consisted of supervisor's ratings on each individual at the completion of training.

Rating Scale:

An adaptation of USES Form SP-21, "Descriptive Rating Scale" was used. This scale (see appendix) consisted of 10 items covering different aspects of job performance. Each item has five alternatives corresponding to different degrees of job proficiency.

Reliability:

Only one rating was obtained. Therefore, no measure of criterion reliability was computed.

Criterion Score Distribution:

Possible Range:	10-50
Actual Range	18-41
Mean:	30.9
Standard Deviation:	4.9

Criterion Dichotomy:

The criterion distribution was dichotomized into low and high groups by placing 33% of the sample in the low group to correspond with the percentage of workers considered by the employer to be unsatisfactory or marginal. Workers in the high criterion group were designated as "good workers" and those in the low group as "poor workers." The criterion critical score is 29.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were selected for tryout in the norms on the basis of a qualitative analysis of job duties involved and a statistical analysis of test and criterion data. Aptitudes P and K were considered because the qualitative analysis indicated they were important and had relatively high means. Aptitude Q was considered because it had a relatively high mean and a low standard deviation. With employed workers, a relatively high mean and/or a relatively low standard deviation may indicate that some sample pre-selection has taken place. Tables 3, 4, and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on job analysis, the aptitudes listed appear to be important to the work performed)

Aptitude	Rationale
G - General Learning Ability	Necessary for learning job and making individual judgments.
S - Spatial Aptitude	Necessary to visually determine the smoothness and uniformity of yarn.
P - Form Perception	Necessary to compare group of filling shipping bobbins to determine that they are uniform in shape.
K - Motor Coordination	Necessary to thread machines rapidly.
F - Finger Dexterity	Necessary to clip, tie and thread yarn.
M - Manual Dexterity	Necessary to place and remove bobbins at machine positions.

TABLE 4

Means (M), Standard Deviations (SD), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for the aptitudes of the GATB.

Aptitude	Mean	SD	Range	r
G - General Learning Ability	93.2	15.6	64-130	.186
V - Verbal Aptitude	92.5	14.3	68-127	.038
N - Numerical Aptitude	96.5	15.5	59-128	.200
S - Spatial Aptitude	96.2	17.9	61-140	.206
P - Form Perception	109.6	16.5	75-151	.186
Q - Clerical Perception	113.0	14.5	68-147	.236
K - Motor Coordination	112.7	16.1	64-149	.204
F - Finger Dexterity	108.2	21.8	65-166	.073
M - Manual Dexterity	108.1	21.5	61-156	.001

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X			X	X		X	X	X
Irrelevant									
Relatively High Mean					X	X	X		
Relatively Low Standard Dev.		X				X			
Significant Correlation with Criterion									
Aptitudes to be Considered for Trial Norms					P	Q	K		

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of aptitudes P, Q and K at trial cutting scores were able to differentiate between 67% of the sample considered good workers and 33% of the sample considered poor workers. Trial cutting scores at five point intervals approximately one standard deviation below the mean are tried because this will eliminate about one-third of the sample with three-aptitude norms. For two-aptitude trial norms, minimum cutting scores of slightly more than one standard deviation below the mean will eliminate about one-third of the sample; for four-aptitude trial norms, cutting scores of slightly less than one standard deviation below the mean will eliminate about one-third of the sample. The phi coefficient was used as a basis for comparing trial norms. The optimum differentiation for the occupation of Twister-Tender (asbestos prod.; glass mfg.; synthetic fibers; textile) 681.885-110 was provided by norms of P-105, Q-95, and K-85. The validity of these norms is shown in Table 6 and is indicated by a phi coefficient of .28 (statistically significant at the .025 level).

TABLE 6

Predictive Validity of Test Norms, P-105, Q-95 and K-85

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	11	30	41
Poor Workers	12	8	20
Total	23	38	61

Phi Coefficient (ϕ) = .28

Chi Square (X^2_y) = 5.0

Significance Level = $P/2 < .025$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 62 OAP's included in the 1970 edition of Section II of the Manual For The General Aptitude Test Battery. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.

SP-21

A-P-P-E-N-D-I-X

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

Score_____

RATING SCALE FOR_____
D. O. T. Title and Code

Directions: Please read Form SP-20, "Suggestions to Raters", and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

Name of Worker (print)_____
(Last) (First)

Sex: Male_____ Female_____

Company Job Title:_____

How often do you see this worker in a work situation?

1. _____ See him all the time.
2. _____ See him at work several times a day.
3. _____ Seldom see him in a work situation.

How long have you worked with him?

1. _____ Under one month.
2. _____ At least one month but less than two.
3. _____ At least two months but less than three.
4. _____ At least three months but less than six.
5. _____ Six months or over.

A. What is his degree of manual dexterity?

1. _____ Unsatisfactory -- awkward -- handles himself slowly -- not able to keep up.

2. _____ Performs satisfactorily but below levels expected of average worker in this operation.

3. _____ Performs satisfactorily most of the time.

4. _____ Well above average -- handles himself well -- fast and accurate.

5. _____ Outstanding -- handles himself extremely well with noticeable ease and economy of motion.

B. Safety Performance.

1. _____ Performance below minimum standards -- will take a chance -- is injury prone.

2. _____ Performance is up to minimum standards -- has a tendency to be careless -- unaware of fellow employes' safety.

3. _____ Performance is above minimum standards -- has a satisfactory knowledge and application of safety procedures.

4. _____ Performance above average -- seldom violates safety rules -- exercises good judgement safety-wise.

5. _____ Performance is on an outstanding level -- requires little or no follow-up -- personal dress and tool handling is exceptionally safe.

C. How much work can he get done? (Worker's ability to make sufficient use of his time.)

1. _____ Capable of very low work output.

2. _____ Capable of low work output.

3. _____ Capable of fair work output.

4. _____ Capable of high work output.

5. _____ Capable of very high work output.

D. Quality of Work.

1. _____ Below area standards -- has excessive number of off-standards -- is inconsistent in quality checks.

2. _____ Meets minimum area standards -- requires excessive supervision and follow-up -- makes frequent quality errors.

3. _____ Above minimum area standards -- is satisfactory in accuracy of work.

4. _____ Well above area standards -- seldom makes a mistake -- good, accurate worker.

5. _____ Quality performance is outstanding -- work is accurate and complete.

E. Initiative and Leadership.

1. _____ Always waits to be told what to do and still needs some help in getting started.

2. _____ Relies on others -- must be told what to do -- seldom helps fellow workers.

3. _____ Will act voluntarily in matters involving deviation of routine -- usually sets a good example for fellow workers.

4. _____ Will act voluntarily in most matters -- frequently influences good performance from fellow workers.

5. _____ Displays a great deal of zeal for his job -- alert at all times -- regarded as a good leader by the work group.

F. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)

1. _____ Has very limited job knowledge -- does not know enough to do his job adequately.

2. _____ Has little knowledge -- knows enough to "get by."

3. _____ Has moderate amount of knowledge -- knows enough to do fair work.

4. _____ Has broad knowledge -- knows enough to do good work.

5. _____ Has complete knowledge -- knows his job thoroughly.

G. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several operations in his work.)

1. _____ Cannot perform different operations adequately.

2. _____ Can perform several different operations with reasonable efficiency.

3. _____ Can perform a limited number of different operations efficiently.

4. _____ Can perform many different operations efficiently.

5. _____ Can perform an unusually large variety of different operations efficiently.

H. How resourceful is he when something different comes up or something out of the ordinary occurs? (Worker's ability to apply what he alreadys knows to a new situation.)

1. _____ Almost never able to figure out what to do and needs help on nearly every minor problem.

2. _____ Often has difficulty handling new situations. Needs help on all but minor problems.

3. _____ Sometimes knows what to do; sometimes doesn't. Can deal with problems that are not too complex.

4. _____ Is usually able to handle new situations. Needs help on only complex problems.

5. _____ Practically always figures out what to do himself.

I. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing a job easily and well.)

1. _____ Has great difficulty doing his job -- not at all suited for this type of work.

2. _____ Usually has some difficulty doing his job -- not too well suited to this kind of work.

3. _____ Does his job without too much difficulty -- fairly well suited to this type of work.

4. _____ Usually does his job without difficulty -- well suited to this kind of work.

5. _____ Does his job with great ease -- exceptionally well suited for this kind of work.

J. Considering all the factors already rated, and only these factors, how acceptable is his work? (Worker's "all-around ability" to do his job.)

1. _____ Would be better off without him -- performance usually not acceptable.

2. _____ Of limited value to the organization -- performance somewhat inferior.

3. _____ A fairly proficient worker -- performance generally acceptable.

4. _____ A valuable worker -- performance is usually superior.

5. _____ An unusually competent worker -- performance almost always top notch.

S-452

FACT SHEET

Job Title: Twister-Tender (asbestos prod.; glass mfg.; synthetic fibers; textile) 681.885-110

Job Summary: Tends machine to twist together strands of spun nylon yarn into single strand of yarn to increase strength, smoothness, and uniformity of yarn.

Work Performed: Creels machine with bobbins of undrawn yarn. Threads yarn through balloon guides, and lifts lever which allows traveler ring to engage lay rail of machine. Patrols machine positions to see that yarn is feeding smoothly from spin bobbins, is properly threaded through guides, is under proper tension, and is winding evenly around shipping bobbin. If yarn breaks, secures broken end of yarn to shipping bobbin, replaces yarn in guides, or clips yarn and threads position again. Affixes colored tag to filled shipping bobbin with elastic band to indicate whether yarn is first quality, second quality, salvage or waste. Doffs filled shipping bobbin and carries to "A" frame rack and places it upon prong. Takes empty shipping bobbin from "A" frame rack and places it on spindle at machine position.

Effectiveness of Norms: Only 67% of the nontest-selected workers used for this study were good workers; if the workers had been test-selected with the S-452 norms, 79% would have been good workers. 33% of the nontest-selected workers used for this study were poor workers; if the workers had been test-selected with the S-452 norms, only 21% would have been poor workers.

Applicability of Norms: The aptitude test battery is applicable to jobs which include a majority of job duties described above.

GPO 898.736

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